A Correct Tide-Table, *ſhewing the true Times of the* High-Waters *at* London-Bridge, *to every day in the Year* 1683. *By Mr.* Flamſtead.

		Januar.		Februa.		March		April.		May.		June.	
		H.	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*
1.	M	0	09	1	52	0	34	2 ⊙	13	2	38	3	35
	A	0	43	2	19	1	07	2	35	2	58	3	52
2.	M	1	16	2	43	1	37	2	55	3	17	4	09
	A	1	46	3	05	2	03	3	14	3	35	4	25
3.	M	2	14	3	24	2	27	3	22	3	53	4 ⊙	42
	A	2	39	3	42	2	49	3	50	4	11	5	00
4.	M	3	01	4 ⊙	00	3 ⊙	09	4	08	4	29	5	19
	A	3	22	4	18	3	28	4	25	4	47	5	39
5.	M	3	42	4	36	3	44	4	44	5	08	6	00
	A	4	01	4	55	4	02	5	05	5	29	6	22
6.	M	4	19	5	16	4	20	5	27	5 ⊙	51	6	45
	A	4	39	5	39	4	38	5	49	6	15	7	08
7.	M	4 ⊙	59	6	02	4	57	6	15	6	40	7	33
	A	5	20	6	27	5	18	6	42	7	06	7	59
8.	M	5	41	6	54	5	41	7 ⊙	11	7	33	8	25
	A	6	05	7	22	6	07	7	40	7	59	8	52
9.	M	6	30	7	54	6	33	8	10	8	27	9	21
	A	6	58	8	26	7	03	8	42	8	56	9	50
10.	M	7	27	8	59	7	32	9	13	9	24	10 ⊙	20
	A	7	56	9	32	8	04	9	43	9	52	10	50
11.	M	8	27	10 ⊙	06	8 ⊙	36	10	13	10	21	11	20
	A	8	59	10	39	9	10	10	42	10	49	11	50
12.	M	9	31	11	13	9	42	11	10	11	15		
	A	10	04	11	43	10	14	11	38	11	44	0	20
13.	M	10	37			10	45			⊙		0	51
	A	11	11	0	13	11	15	0	05	0	12	1	20
14.	M	11 ⊙	43	0	40	11	44	0	30	0	38	1	46
	A			1	05			0	55	1	05	2	12
15.	M	0	14	1	29	0	13	1 ⊙	17	1	29	2	37
	A	0	43	1	51	0	39	1	39	1	52	3	00

		July.		Auguſt.		Septem		Octob.		Novem		Decem.	
		H.	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*	*H.*	*M.*
1.	M	3 ⊙	45	4	19	4	59	5	25	7	02	7	32
	A	4	00	4	34	5	18	5	48	7	34	8	04
2.	M	4	15	4	49	5 ⊙	38	6	14	8	08	8 ⊙	36
	A	4	33	5	05	6	01	6	43	8	43	9	10
3.	M	4	46	5	22	6	26	7	15	9	18	9	43
	A	5	02	5	41	6	55	7	48	9	53	10	17
4.	M	5	19	6	01	7	23	8	25	10 ⊙	26	10	50
	A	5	38	6	23	7	57	9	02	11	01	11	24
5.	M	5	57	6 ⊙	48	8	34	9	32	11	35	11	57
	A	6	17	7	15	9	12	10	17				
6.	M	6	39	7	43	9	50	10	54	0	07	0	29
	A	7	03	8	14	10	29	11	31	0	38	1	00
7.	M	7	28	8	50	11	09	⊙		1	08	1	28
	A	7	55	9	26	11	46	0	06	1	36	1	55
8.	M	8 ⊙	23	10	02			0	36	2	02	2	20
	A	8	53	10	38	0	22	1	08	2	26	2	42
9.	M	9	24	11	18	0 ⊙	55	1	36	2	47	3 ⊙	04
	A	9	58	11	57	1	26	2	02	3	08	3	22
10.	M	10	31			1	53	2	26	3	26	3	40
	A	11	07	0	33	2	19	2	48	2	48	3	58
11.	M	11	43	1	07	2	41	3	07	4 ⊙	04	4	15
	A			1	38	3	01	3	25	3	25	4	33
12.	M	0	19	2 ⊙	06	3	20	3	44	3	44	4	50
	A	0	51	2	31	3	39	4	02	3	02	5	08
13.	M	1	23	2	53	3	56	5	24	4	20	5	28
	A	1	52	3	13	4	14	5	46	4	40	5	46
14.	M	2	19	3	32	4	33	6 ⊙	10	5 ⊙	01	6	07
	A	2	44	3	50	4	52	6	35	5	25	6	28
15.	M	3 ⊙	05	4	08	5	13	5	48	7	01	6	52
	A	3	25	4	26	5	37	6	15	7	27	7	14

M Stands for Morning. *A* Afternoon. ⊙ for Sunday.

		Januar.		Februa.		March.		April.		May.		June.		July.		Auguſt.		Septem		Octobe.		Novem		Decem.	
		H.	M.	H.	M.	H.	M.	H.	M.	H.	M	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
16.	M	1	10	2	12	1	03	2	00	2	14	3	20	3	44	4	46	6	02 ⊙	6	42	7	54	7	38 ⊙
	A	1	35	2	31	1	26	2	20	2	35	3	39	4	04	5	04	6	30	7	12	8	22	8	04
17.	M	1	58	2	47	1	47	2	39	2	56	3	59 ⊙	4	22	5	26	7	00	7	42	8	49	8	30
	A	2	19	3	03	2	07	2	56	3	15	4	18	4	40	5	49	7	31	8	13	9	17	8	56
18.	M	2	39	3	18 ⊙	2	26 ⊙	3	13	3	34	4	38	5	00	6	15	8	03	8	43	9	44 ⊙	9	24
	A	2	56	3	32	2	43	3	29	3	53	4	59	5	21	6	42	8	37	9	14	10	11	9	53
19.	M	3	12	3	46	2	58	3	46	4	12	5	20	5	43	7	12 ⊙	9	11	9	44	10	38	10	22
	A	3	27	4	00	3	13	4	04	4	31	5	44	6	08	7	43	9	44	10	14	11	06	10	53
20.	M	3	41	4	14	3	28	4	22	4	51 ⊙	6	09	6	33	8	17	10	17	10	43	11	33	11	34
	A	3	55	4	29	3	43	4	41	5	14	6	34	7	02	8	51	10	48	11	11	11	59	11	24
21.	M	4	09 ⊙	4	45	3	58	5	02	5	38	7	03	7	30	9	26	11	19	11	39 ⊙				
	A	4	23	5	02	4	14	5	26	6	05	7	32	8	02	10	00	11	48			0	26	0	25
22.	M	4	38	5	21	4	31	5	50 ⊙	6	22	8	03	8	34 ⊙	10	34			0	05	0	52	0	53
	A	4	53	5	42	4	48	6	18	7	03	8	34	9	09	11	09	0	16	0	29	1	16	1	22
23.	M	5	09	6	06	5	09	6	48	7	34	9	07	9	43	11	41	0	42 ⊙	0	52	1	39	1	48 ⊙
	A	5	28	6	31	5	31	7	20	8	07	9	40	10	18			1	05	1	14	2	02	2	14
24.	M	5	48	7	00	5	55	7	53	8	39	10	14 ⊙	10	54	0	12	1	28	1	36	2	23	2	38
	A	6	09	7	32	6	23	8	28	9	13	10	47	11	28	0	39	1	48	1	56	2	44	2	59
25.	M	6	32	8	07 ⊙	6	54 ⊙	9	04	9	47	11	22			1	06	2	08	2	15	3	03 ⊙	3	19
	A	6	58	8	43	7	26	9	41	10	10	11	54	0	01	1	30	2	26	2	34	3	21	3	38
26.	M	7	26	9	22	7	59	10	16	10	52			0	32	1	52 ⊙	2	42	2	51	3	39	3	55
	A	7	56	10	02	8	37	10	51	11	26	0	26	1	00	2	12	2	58	3	08	3	57	4	14
27.	M	8	28	10	42	9	16	11	26	11	58 ⊙	0	57	1	26	2	30	3	13	3	24	4	17	4	33
	A	9	03	11	22	9	55					1	24	1	50	2	47	3	27	3	40	4	36	4	53
28.	M	9	40 ⊙			10	34	0	00	0	29	1	50	2	13	3	03	3	42	3	57 ⊙	4	57	5	13
	A	10	18	0	00	11	11	0	31	0	59	2	14	2	33	3	17	3	57	4	14	5	19	5	36
29.	M	10	58			11	47	1	00 ⊙	1	26	2	35	2	51 ⊙	3	31	4	12	4	32	5	41	5	59
	A	11	37					1	28	1	51	2	55	3	08	3	44	4	28	4	51	6	06	6	24
30.	M					0	22	1	53	2	15	3	13	3	23	3	58	4	44 ⊙	5	13	6	33	6	52 ⊙
	A	0	15			0	54	2	16	2	38	3	29	3	38	4	13	5	03	5	37	7	03	7	20
31.	M	0	51			1	22			2	58			3	51	4	27			6	03			7	46
	A	1	23			1	48			3	17			4	05	4	43			6	30			8	20

M Stands for Morning. *A* Afternoon. ⊙ for Sunday.

An Account of the foregoing Tide-Table.

By the ſame Hand.

Sir,

COnſidering how much the River of *Thames* is frequented by Shipping, and how long it has been the Chief Place of *Commerce* in theſe Parts of the World, one would think our *Seamens Accounts* of its *Tides* ſhould be very exact, and their Opinions concerning them Rational; whereas if they be enquired into, nothing will be found more Erroneous and Idle.

For they taking notice that the *High-waters* at and near the *New* and *Full Moons*, run an hour and a half, or two *Points* of the *Compaſs* longer than at the *Quarters*, conclude generally, that 'tis the Inconſtancy of the *Winds* that cauſes it, never conſidering how improbable it is, that ſo inconſtant and changeable a *Cauſe* ſhould effect ſo conſtant an *Inequality*.

In which Opinion the *Tide-Tables* of our *Almanacks* have contributed much to confirm them; for therein the *Moons Age* is got by the *Epacts*, thence the Time of her *Southing* by the allowance of 48 minutes of Time for every Days Age, as if her *Diurnal Motions* and *Returns* to the *Meridian* were altogether equable, than which nothing is more falſe; and then the Time of the *High-Water* at *London-Bridge* is made by adding 3 hours to the Time of her *Southing* ſo got, as if there were the ſame conſtant ſpace of Time betwixt the *Moons Southing*, and the *High-Waters*, which by this means are often made two hours different from Truth and Experience.

To amend this fault, ſome of the more skilful have Calculated the Times of the *Moons Southings* exactly, and then made their *Tide-Tables* by adding 3 hours conſtantly to them, by which means, tho they agreed nearer with Experience at the *Spring-Tides*, or near the *New* and *Full Moon*, yet they erred not much leſs (than by the old way of account they would have done) at the *Quarters*, or in the *Neap-Tides*; the Inequality of the *Tides* being above double to the Errour committed in finding the *Moons Southings* by her *Age*.

Mr. *Booker* was the firſt that gave any Directions for the amendment of this Reckoning, and that was only to ſubſtract an hour from the Times in his *Tide-Table*, about the firſt and laſt *Quarters* of the *Moon*, becauſe the *Neap-Tides* did not flow ſo long as the *Springs*, by one *Point* of the *Compaſs*. But Mr. *Henry Philips*, a Perſon well known by his Works of *Navigation*, was certainly, the firſt that brought the Inequality to a *Rule*, whoſe *Theory* of the *Tides*, and a *Table* grounded on it, for the *Year* 1668, was printed in Mr. *Oldenburgh's Philoſophical Tranſactions*, for the Month of *April* that Year, *Numb.* 34. which was found much more conformable to Experience than was expected.

Having frequent Occaſion to paſs betwixt *London* and *Greenwich* by Water, ſome two Years agone, I took notice that the *Tides* ſeldom held out ſo long as Mr. *Philips's* Calculation gave them, and therefore in the Months of *October* and *November*, I began to obſerve them more diligently, and procured them to be carefully noted by an ingenious Friend at *Tower-Wharfe*. From theſe Obſervations I raiſed a Correction of Mr. *Philips's Numbers*, and cauſed a *Tide-Table* to be made agreeable to it, which was Printed by Mr. *Hook* in his *Philoſophical Collections*, *Numb.* 4.

But the Weather then proving ſtormy and unſeaſonable, I durſt not rely on thoſe *Obſervations*, nor that *Correction*, and therefore in the *Spring* and *Summer Months* following of the *Year* 1682, I ſet to obſerve them again, and with the help of my Friends and Servants, I noted the Times of above 80 *High-Waters* at *Tower-Wharſe* and *Greenwich*, whereby I found that the greateſt and leaſt differences betwixt the *Moons true Southing*; and the *High-waters*, were not, as Mr. *Philips* had placed them, at the *Full* or *New* and *Quarter Moons*, but the greateſt nearer to the *Neaps*, the leaſt to the *Higheſt Spring-Tides*. I found alſo, that the Inequality was not the ſame that he had made it, and after a Trial or two, that I could repreſent and anſwer above 60 of theſe *Obſervations* with

leſs

leſs than one quarter of an hours difference; which, conſidering how difficult it is to determine the Time of an *High-Water* exactly, I cannot but eſteem a very good Agreement.

Hitherto our *Tide-Tables* have only ſhewed the time of that *one High-water* which next follows the *Moons Southing*, but in this new *Table* I have given the times of both, concerning which, I deſire it may be noted.

That when by reaſon of great *Droughts* in *Summer*, or extreme *Froſts* in *Winter*, the *Springs* are low, and the *Freſh Waters* leſs than uſual, the *Tides* may hold up longer than the Times noted in the *Table*; as alſo when ſtrong *North-Weſterly* or *Northerly Winds* blow, which bring in an Extraordinary Floud from the *Northern Seas*, and keep it up longer than other times.

So on the contrary, when the Winds blow hard on the *Oppoſite Points* of the *Compaſs*, or when we have much *Rain* and great *Freſhes*, the *Tides* hold not out ſo long as the Times ſhewed in the *Table*, the *Freſhes* overpowring and checking them ſooner; Yet have I never found that the differences betwixt the *Calculated* and *Obſerved High-Waters* have much exceeded half an hour; Moſt commonly they are ſcarce half ſo much.

This *Table* may be reduced and made to ſerve for any other *Port* of His Majeſties Dominions or Neighbouring Countrys, by only ſubſtracting or adding ſo much time to the *High-Waters* noted in it, as the *High-Water* obſerved in the ſaid place ſhall be found to precede, or follow the Time of the *High-Water* the ſame Day herein noted. For by ſuch Accounts as I have met with and received of the *Tides* in remote Places, I find there is every where, about *England*, the ſame difference betwixt the *Spring* and *Neap-Tides*, that is here obſerved in the River of *Thames*.

I could eaſily have made and given you a *Table* for this *Reduction*, if I durſt have relied, on the Account our *Mariners* give of the *Tides* in other Ports, but I find their Opinions different, except where they have copied from one another in their *Kalendars*, by reaſon of the aforemention'd difference betwixt the Times of the *Moons ſouthings*,

Southings, and the True *High-Waters*, for which reaſon I forbear it, till further Experience ſhall have informed us better.

An Obſervation of the Beginning of the Lunar Eclipſe *which hapned* Aug. 19. 1681. *in the Morning, made on the* Iſland *of St.* Lawrence *or* Madagaſcar, *by Mr.* Tho. Heathcot, *and communicated by Mr.* Flamſtead.

MR. *Heathcot* was Chyrurgeon to a Ship which lay then at the bottom of a deep *Bay* on the *Weſtern Shore* of the *Iſland*, and that part which the *Portugeſe* and our Maps call the *Terra del Gada*, he had with him then on Shore, a *Quadrant* of 2 Foot *Radius*, and a *Teleſcope* of 9 Foot, but no Clock; to ſupply which defect, he made a *Pendulum* of a String and a Bullet 39 Inches long, that each ſingle *Vibration* might anſwer a *Second* of Time: Waiting the beginning of the *Eclipſe* with his Glaſs, as ſoon as he ſaw the True *Shadow* enter on the *Moons Limb*, he cauſed his Friends, who aſſiſted him, to make the *Pendulum* Vibrate, and count its Vibrations; of which they had numbred 140 $\overset{\prime}{2}\ \overset{\prime\prime}{20}$ of time when he took the height of *Procyon* (then Eaſt of the *Meridian*) $\overset{\circ}{25}\ \overset{\prime}{39}$ the next day he obſerved the Suns *Meridional* height with the ſame *Quadrant*, whence he found the *Latitude* of that Place $\overset{\circ}{19}\ \overset{\prime}{29}$ South, hence the time when he took the Height of *Procyon* is found $\overset{h}{4}\ \overset{\prime}{51}$ *mane*, and ſubſtracting the $\overset{\prime}{2}\ \overset{\prime\prime}{20}$ paſt ſince the obſerved beginning of the Eclips, its

	h	′	″
True Beginning was at	4	48	40
Which at the Obſervatory, here, I noted at	1	50	40
therefore this part of *Madagaſcar* more *eaſterly*	2	58	00

or $\overset{\circ}{44}\ \overset{\prime}{30}$, which our Maps make 52 *gr*; that is 7½ *gr* more remote from it than it really is.